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Communications

MANAGING SOFTWARE CONFIGURATION



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This instruction implements AFPD 33-1, *Command, Control, Communications, and Computers (C4) Systems*. It references DoD 5000-2, AF Sup 1, *Management Acquisition Policies and Procedures*, by establishing practices for configuration management (CM) of USAF Academy administrative software which the 10th Communications Squadron (10 CS) acquires, develops, and maintains. It prescribes uniform CM requirements, applications, objectives, and definitions for use throughout the software's life cycle. This instruction applies to all organizations at the USAF Academy using software under 10 CS's purview, including new requirements, changes to existing capabilities, or deletion of functions in a software system.

Summary of Revisions

Updates office symbol and references; defines administrative software.

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1. What is an Administrative Computer System? It is an automated information system that:

- 1.1. Is not currently maintained by a contractor (i.e., a current maintenance contract exists);
- 1.2. Is not centrally supported by Gunter AFB/Standard Center (SSC) as part of the Standard Base Level Computing (SBLC) environment;
- 1.3. Is not directly related to classroom instruction and department management, and it is currently the responsibility of Athletics (HQ USAFA/AH), Admissions (HQ USAFA/RR), Dean of the Faculty (HQ USAFA/DF), and the 34th Training Wing (34 TRW);
- 1.4. Is resident on the Cadet Administrative Management Information System (CAMIS) mainframes;
- 1.5. Is resident of the Hewlett Packard minicomputers;
- 1.6. Is a microcomputer-based application/database system (this includes those “inherited” from the Support Flight (10 CS/SCS) and those developed and maintained by Software Support Flight (10 CS/SCA));
- 1.7. Is supported by an approved C4 System Requirement Document (CSR D);
- 1.8. Is under software configuration management by 10 CS.

2. What is an Operating System? It is the software or firmware master control structure closest to the computer hardware that acts as a combination of scheduler and traffic cop (e.g., POSIX, UNIX, PHGS).

2.1. POSIX (Portable Operating System Interface Standard) . It is an interface specification for a portable operating system, such as UNIX, that defines the interface between application programs and the operating system. By defining a standard interface that can be implemented on multiple platforms, POSIX makes it possible to develop transportable applications. Those applications developed for a POSIX compliant operating system will be transportable from one vendor’s hardware to another’s with little or no modification.

2.2. POSIX.1 (Portable Operating System for Computer Environments). It is a standard operating system interface defining external characteristics and facilities required to achieve portability of applications at the source code level.

2.3. UNIX . It is the de facto industry standard operating system supported on a wide range of hardware systems from a variety of vendors. It is a general purpose, multi-user, interactive operating system originally developed by AT&T Bell Laboratories.

2.4. PHIGS (Programmer’s Hierarchical Interactive Graphics Standard) . It is a graphics programming architecture that uses hierarchically structured display files allowing for rapid dynamic display and modification of 2D and 3D graphical data.

3. Systems Software . It is designed for a specific software system, or family of software systems, to facilitate its (and its associated applications; i.e., operating systems, compilers, and utilities) development, operation, and maintenance. It also includes all the efforts required to design, develop, integrate, and checkout the system software, including all software developed to support any mission product software development.

3.1. Application Software . 10 CS/SCA developed code used by the end customer to access, update, or query a software system.

4. What Configuration Management (CM) Does. CM identifies, controls, accounts for, and audits the functional and physical characteristics of an information system. Because operational software and systems software support are essential and expensive, effectively managing these resources is essential to accomplish the Academy's mission economically.

5. How CM Works. To manage software configuration, we establish responsibilities and procedures for each of the following: a configuration control board (CCB); configuration review boards (CRB); configuration managers; functional area managers; functional area representatives; Chief, Application Software Support Section (10 CS/SCAA); Chief, Systems Software and Standards Section (10 CS/SCAS); and Chief, Software Systems Flight (10 CS/SCA). Collectively, they identify all configuration items (CI) to include computer program configuration items (CPCI); identify functional and operational baselines; establish change control procedures; and maintain the project management system.

5.1. What Major Functional Areas Do . Each major functional area, *i.e.*, the HQ USAFA/DF, Commander of 34 TRW, HQ USAFA/RR, HQ USAFA/AH), Information Management (10 MSS/IM), 10 CS, and Plans and Programs (HQ USAFA/XP) selects qualified people to participate in the Academy's CM program. The level of proposed changes determine which area of responsibility deal with the change. (See paragraph 7. for level of changes).

5.2. What the Configuration Control Board (CCB) Does. The CCB acts as the final authority for major issues concerning administrative software with wide-ranging impact on the Academy, such as major software and hardware conversions, up-grades, and redesign. The CCB consists of functional area managers or senior members from HQ USAFA/DF, 34 TRW, HQ USAFA/RR, HQ USAFA/AH, 10 MSS/IM, 10 CS, and HQ USAFA/XP, who elect a chairman for a 1 year term.

5.2.1. Approves all Class I changes (see paragraph 7.1).

5.2.2. Prioritizes requirements affecting more than one functional area.

5.2.3. Resolves all configuration management issues brought before it by 10 CS/SCA or any CCB member or representative.

5.2.4. Ensures senior staff are kept informed of Academy requirements and capabilities for administrative management information systems.

5.3. What a Configuration Review Board (CRB) Does. The CRB, consisting of 10 CS/SCAA, the functional area manager, the functional area representative, the Academy Data Administrator, and individuals having vested interest in the change, reviews new requirements for validity, data element standardization, completeness, cost benefit, and priority. The CRB is co-chaired by 10 CS/SCAA and the functional area manager; they convene monthly CRBs to review all new changes.

5.4. What Configuration Managers Do:

5.4.1. Approve emergency changes.

5.4.2. Approve cycle or version content agreements and changes thereto.

5.5. What Functional Area Managers (FAM) Do:

5.5.1. Serve as members of the CCB when so designated by the head of the functional area.

5.5.2. Co-chair the CRB.

5.6. What the Chief, 10 CS/SCAA Does:

- 5.6.1. Establishes processing cycles for software releases.
- 5.6.2. Conducts CRBs with major functional areas at least once a month.
- 5.6.3. Provides initial analysis of changes for impact on current system and for needed resources.
- 5.6.4. Determines the class and type of change (see paragraph 7.); assigns a project number, and logs it into the project management system.
- 5.6.5. Approves all Class II Type 2 changes within the section. The project's priority assigned during the CRB determines the order for processing changes.
- 5.6.6. Advises 10 CS/SCA about changes that require higher level approval. Attaches relevant information to the recommended priority order.

5.7. What the Chief, 10 CS/SCAS Does. Manages the CM Program for USAF Academy administrative computing systems by implementing and administering the CM plan, which must conform to DoD-Std-2167A process.

5.8. What the Chief, 10 CS/SCA Does. Formulates broad policy and procedures for managing Academy administrative communication/computer systems over their life cycle. 10 CS/SCA:

- 5.8.1. Approves all Class II Type 1 changes.
- 5.8.2. Meets at the request of any functional area to discuss Class I changes and unresolved Class II Type 1 changes or issues before recommending approval to the CCB.

5.9. What Functional Area Representatives Do:

- 5.9.1. Validate all change requests before submitting them to 10 CS/SCAA.
- 5.9.2. Set priorities for all change requests within their area.
- 5.9.3. Coordinate on establishing processing cycles.

6. How Configuration Identification Works. To control and account for any system's configuration, we identify levels at which configuration management applies. The term "configuration item (CI)" describes the product level at which configuration management applies. The need to control an item's functional characteristics and its interface with other items determines whether software, documentation, and system support software are identified as a CI using a baseline process. The term "computer program configuration item (CPCI)" identifies elements within the CI. 10 CS/SCA identifies Academy software CIs and CPCIs when developing the system specification.

6.1. Using Baseline Management . Once the CIs or CPCIs are identified and defined, CM uses the "baseline" concept--establishing reference or departure points from which to control changes--to be sure the level of documentation and the level of software match. Baseline changes occur only through formal, documented processes. Two types of baselines come under management:

- 6.1.1. Functional--described by the approved functional description.
- 6.1.2. Operational--described by the current documentation, such as program maintenance manual, user manual, and operation manual when the system is released for user support.

6.2. Requiring Identification Compatibility. Functional and operational baselines must be consistent and compatible, and traceable to the top-level specification. Should conflicts arise between such

baselines, the order of precedence will be (1) functional and (2) operational unless waived by 10 CS/SCA.

7. Controlling Change. After establishing an item's configuration identification and baselines, changes to configuration require systematic evaluation, coordination, and implementation. CCB, 10 CS/SCA, CRB, configuration managers, 10 CS/SCAA, functional area managers, and functional area representatives jointly control such change.

7.1. Classes of Change:

7.1.1. Class I changes require CCB approval and have any of the following characteristics:

7.1.1.1. Requires more than 320 work hours (2 months) to complete, including analysis, programming, testing, and documentation.

7.1.1.2. Likely requires new hardware or hardware reconfiguration to implement the new capability.

7.1.1.3. Requires coordination between more than one functional area for a new system or major redesign.

7.1.1.4. Requires possible reallocation of 10 CS/SCA resources to complete.

7.1.2. Class II changes do not meet any of the Class I characteristics. Class II changes need go no higher than the SCS for approval. The two types of Class II changes are:

7.1.2.1. Class II Type 1 that require 10 CS/SCA approval:

- Changes submitted on an AF Form 3215, **C4 Systems Requirement Document (CSR)**, not classified as Class I.
- Any minor change affecting more than one functional user or area
- Changes that require a new data base element or a change to the data dictionary
- Any change requiring more than 160 work hours (1 month) to complete, including analysis, programming, testing, and documentation.

7.1.2.2. Class II Type 2 that require 10 CS/SCAA approval. Any change that affects only one functional user or area and does not fall into any of the above categories.

7.2. Establishing Change Priority . 10 CS/SCAA and the functional area manager or functional area representative jointly establishes the priority for a change during the CRB. Emergency changes must be approved by the configuration managers, both 10 CS and the head of the functional area (or designated representative) for that change. 10 CS/SCA or CCB will prioritize changes for which they have approval authority after considering the recommended priority of the requester.

7.2.1. Emergency Change--necessary to prevent mission failure. This priority is not a replacement for unplanned or untimely changes. The CRB assesses its impact and recommends action to the configuration managers for final approval. An emergency change may or may not offset the previously established cycle priorities.

7.2.2. Urgent Change--corrects an impairment in mission fulfillment. Urgent changes will normally be included in the next scheduled software development cycle.

7.2.3. Routine Change--enhances or fixes an operational system normally within 12 months to enhance mission effectiveness.

7.3. Evaluating Changes. Managers must evaluate every proposed configuration change critically to ensure that it is mission essential using such criteria as:

7.3.1. All impacts of the change on a CI, a CPCI, and any associated CIs with which it interfaces.

7.3.2. Functional area representative has reviewed and validated change proposals to ensure that they provide complete justification.

7.3.3. 10 CS/SCAA has checked the adequacy of the change proposal as well as the effect on interfaces before classifying it.

7.4. Processing Change Proposals:

7.4.1. Anyone can request a change to the system by contacting the appropriate 10 CS/SCAA section for the following conditions:

7.4.1.1. Changing/modifying existing software.

7.4.1.2. Identifying error in existing software.

7.4.1.3. Changing/modifying database.

7.4.1.4. Using AF Form 3215, **C4 Systems Requirements Document (CSRD)**, for all new development.

7.4.2. Functional area representatives evaluate and validate requests before forwarding them to 10 CS/SCAA.

7.4.3. The CRB convenes to review all new and outstanding changes within their functional area. The CRB considers sufficiency of requirements definition, possible impact on other functional areas, cost/benefit concerns, and other areas before 10 CS/SCA initiates system design.

7.4.4. 10 CS/SCAA evaluates the proposed change, assigns all changes a project number, and logs them into the project management system. 10 CS/SCAA validates and forwards Class I and Class II Type 1 changes to 10 CS/SCA. 10 CS/SCAA approves all Class II Type 2 changes.

7.4.5. 10 CS/SCA evaluates Class I and Class II Type 1 changes, gathering any technical information needed. For Class I changes, 10 CS/SCA requests a CCB meeting and presents the change with recommendations. Once 10 CS/SCA approves Class II Type 1 changes, the appropriate office processes it.

7.4.6. The CRB sets change priorities. An SPR's priority derives from the severity of the problem as determined by the functional area representative and 10 CS/SCAA.

7.4.7. Once a change has been approved, it becomes a candidate for implementation; the implementation depending on priority and the amount of software development 10 CS/SCA undertake. The CRB determines each cycle and version contents and forwards it to configuration managers for final approval before the start of the cycle. Once the cycle or version content has been approved, only the configuration managers may change it.

7.4.8. Software development normally does not directly affect the change control process. However, the preliminary design review, critical design review, test readiness review, and system vali-

dation review should all ensure implemented changes meet all requirements fully and properly before becoming the new operational baseline.

7.4.9. We control quality to ensure the user's requirements are met. The persons assigned to do the quality control and the user determine the acceptance criteria for the change. At a minimum, quality control should include checking for adherence to standards, program testing, reviewing documentation, and ensuring the finished product matches the user's request. The quality control manager and user prepare a quality control checklist for each class/type of change and have it approved by the CCB. Checklists approved by the CCB ensure standardized criteria are met.

7.4.9.1. For Class I changes, 10 CS/SCA recommends individuals to the configuration manager for formal appointment as a quality control team member for that project. Team members report to 10 CS/SCA for guidance concerning their duties.

7.4.9.2. For Class II Type 1 changes, 10 CS/SCA appoints the necessary persons to perform quality control directly under 10 CS/SCA.

7.4.9.3. For Class II Type 2 changes, 10 CS/SCAA appoints the person to perform the quality control.

8. Accounting for Configuration Status. Status accounting provides a way to record and report actions affecting CIs and CPCIs to management.

8.1. 10 CS/SCA must establish a project management system to record and report status of an evolving software CI/CPCI throughout its life-cycle. 10 CS/SCAA:

8.1.1. Inputs the request into the project management system after the initial evaluation.

8.1.2. Updates the system to reflect the current status of the change through user acceptance.

9. Auditing and Reviewing Configuration . 10 CS/SCA manages all configuration audits and reviews regardless of scope. The level of a project and the nature of the activity developing it determine the degree of formality and level of management. The reviews described below address highly complex systems; less complex systems, permit less extensive or combined items for the review. 10 CS/SCA determines which items and the degree of review formality.

9.1. Documenting Reviews. When a project consists of a modification to an existing system, documentation of review may consist of revising existing documentation rather than creating completely new documentation.

9.2. Conducting a Preliminary Design Review (PDR). The PDR occurs during development to assure the user that the project's progress responds to the approved requirements and to determine any further direction for the design effort. Completing this review establishes the baseline. jmsCol Shuttleworth, JMThe principle items covered at the PDR include but are not limited to:

9.2.1. Functional description (FD).

9.2.2. Economic analysis.

9.2.3. System and subsystem specifications.

9.2.4. Draft of CPCI test plans, less test procedures.

9.2.5. Data base structure and organization.

9.2.6. Design problems.

9.2.7. Specifications for Federal Information Processing (FIP) equipment in final form if applicable, ready for request for proposal (RFP) preparation.

9.2.8. Data element standardization.

9.3. Conducting a Critical Design Review (CDR). The CDR, a formal review during development, takes place before translating the logic and algorithms to coded instructions. The CDR ensures that the detailed design solution satisfies performance requirements and it verifies that the system design is compatible with other CPCI and within the CPCI. The principle items reviewed at a CDR include but are not limited to:

9.3.1. CPCI test plans, including test procedures.

9.3.2. Draft of user's manual (UM).

9.3.3. Appropriate support documentation, such as updated timing studies, accuracy studies, etc.

9.4. Performing a Test Readiness Review (TRR). A TRR occurs for each CPCI at the end of the development phase to establish the product baseline for that CPCI and to ensure that the test phase is adequate. The TRR covers test plans and preparations and schedules for the test phase.

9.5. Conducting a System Validation Review (SVR). An SVR considers the results of the formal test phase to ensure the automated data system (ADS) satisfies the requirements of the subsystem specification (SS) and functional description (FD). The review covers:

9.5.1. Quality control reports and results.

9.5.2. Test report.

9.5.3. Technical documentation as required.

9.5.4. Configuration management record as required.

9.6. Certifying Acceptance. To complete the SVR, the functional OPR or end user must certify that the ADS satisfies the requirements stated in the FD. Completing the SVR ends the test phase and establishes the operational baseline.

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